SUPPLEMENT.

The Mining Journal,

RAILWAY AND COMMERCIAL GAZETTE:

FORMING A COMPLETE RECORD OF THE PROCEEDINGS OF ALL PUBLIC COMPANIES.

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Original Correspondence.

TRADES UNIONS FOR PROTECTION OF WAGES.

SIR,—I follow up my letter of last week by attempting, as well as the limited space I can hope you will afford me allows, to examine what Trades Unions do, and what they ought to do, towards securing for workmen the highest regular wages and most favourable conditions of employment they can obtain. Under some foolish idea that something was to be gained in the settlement of the question by refusing to look at the real facts of the case, the leaders of these Unions have long persistently denied that supply and demand are the real elements controlling the rise and fall of wages; in other words, asserting that labour is not a commodity, the price of which in purchase and sale is regulated by the same general rules as those influencing all other articles that are bought and sold. Though it may be hoped this fallacy is fast disappearing before better knowledge of what so nearly interests them, yet, as some of those who offer the working class advice and help are even in more darkness than ever they were themselves on this point, a few words may be well given to state what ought to be clear as day to all who are capable of the simplest exercise of reason. Yet whilst keeping their eyes shut for fear of the light forcing its way in upon them, Trades Unions, whenever they have acted at all, have been forced to act on rates of wages by the very regulation of supply and demand which they professed to disbelieve, and this simply because it was the only thing they could do if they did anything. Strikes are a rough mode of raising the rate of wages, by withdrawing the supply of labour from the market. Lock-outs, on the other hand, are resorted to to lower these rates, by withdrawing the demand for labour until the men will accept the wages offered by the masters. These means of raising or lowering wages can only operate between the limits of the utmost the trade can pay without becoming unprofitable to the employers, fixing the highest possible rate, and of the least the workman can exist upon marking the lowest. It would, in many ways, be an evil day for England that saw her working class reduced to work at what may be called the starvation point. But this, thank Heaven, can never come to pass, save in some few mournful exceptional cases, as long as the men are true to themselves, and act so prudently as to profit by the help their Unions, properly managed, can give them in keeping their position.

Though few intelligent working men could miss the true answers to the questions proposed by Mr. Ruskin to the Social Science meeting, a word may, perhaps, not be wasted in showing the fallacy underlying all he has written about wages, as it is just possible to a few the force of his imagination and his earnestness may hide his defects of argument. It is an old story to all conversant with writers on this subject for more than three centuries ago, dreamers and socialists—many of them most benevolent men—indignant at the wrongs and selfishness of existing society, have sought a remedy in tinkering human nature, and altering all our social relations, in the vain expectation of doing away with crime and misery by resolving society into its primitive elements. This benevolent hallucination has led Mr. Ruskin astray, as it formerly captivated Sir Thomas More and the great Bacon. It is so easy to fancy a golden age of perfect equality, where all share alike the work of providing for the necessaries of life, and the wealth their toil produces. The dreamers who frame these theories, forgetting the degraded misery of all savage nations, where something like this state of society exists, coolly start with all the knowledge, comforts, and resources civilisation has produced, assuming they can frame a scheme to avoid the evil and misery inherent in this state of human imperfection, and which find their only remedy in individual improvement, not in altering the laws by which society has built itself up, and been bound together in all ages and from all times, were such alteration in their power.

Could a community be formed in our day on something like the Spartan model, or that of the Orinoco Indians, described by Gumilla, where all are equal, and all work and play in turn, like schoolboys, for a given number of hours a day, it would be to our countrymen, with all their active energies, a life of misery were it possible to maintain it for any time in existence. But it would fall to pieces as soon as created. Each would choose for himself a calling or work for which he found himself best suited, or which he preferred, and no power could prevent the exchange of labour and its products, which by a law of nature of universal operation is the first step from a savage to a civilised state of existence. Truly Mr. Ruskin can do little to help the workman to better his condition if he can offer no more rational plan of action than substituting his impracticable crotchet of each working in turn for paying for labour in money wages.

Dismissing, then, this absurdity, let us hope both masters and men will in future act upon the conviction that their well being depends on their mutual good understanding, working out a fair settlement of the terms of employment. Let them be convinced that in our days of increased intelligence the time is past when either side can permanently take advantage of the other in the terms of the bargain. Those terms they must settle between themselves. No third party can interfere to any advantage between buyer and seller, who understand their own business better than anyone not interested can do. The only case where mediation is useful or allowable is where long strikes have so embittered the feelings of one or both sides that they are wholly unreasonable, and must be treated like children unfit to manage their own affairs. Surely we may hope in future to see few such mournful exhibitions of folly.

Surely the time is come when the waste and fearful misery caused by strikes and lock-outs may be spared. Few, indeed, are the cases where good temper and able management will not come to a fair settlement without recourse to the last extreme. But the Trades Unions to bring about this must make it their business to get accurate knowledge what are the best terms for them the masters can really afford to pay. Hitherto they have taken it too much for granted that the masters would take care of themselves, and could afford any rates they chose to demand. In our days of universal and free competition of all nations this is a dangerous fallacy, working fatal mischief when pushed too far. No advantage can be permanently held which is extorted for a time beyond the fair rate of wages the trade can afford. Therefore, Trades Unions should be well informed before making a point of insisting upon anything that they have a good right to expect it, and a good chance of getting it.

I will now briefly mention some errors the Trades Unions make, which cannot be defended, and must be abandoned when once openly known and discussed, if the Unions are to receive the sympathy and aid of the Legislature and the country generally. They try to produce uniformity in work and wages by bringing all down to the lowest standard, by so dividing employment that there may be something like half or three-quarters work for all, rather than some be thrown out of work when the number seeking employment exceeds the demand. When examining the question of regulating numbers to keep up wages as far as possible, we shall find this is beginning at the wrong end, sure to produce at last a general reduction of the prosperity of a trade, and consequent decline of power to pay wages. In these days of competition nothing but the best work in sufficient quantity can certainly command the highest wages, and place the English workman securely in his proper place at the head of his class, all the world over. I regret to see recent instances of Trades Unions arbitrarily denouncing piece-work—the fairest to the workman of all modes of paying wages. This they will have ere long to give up; indeed, all dictation and menace will ere long be fatal to their existence. They may depend upon it the days of Unions on such principles are numbered, to be succeeded by Unions on far better principles, securing by fair agreement with masters all the working class are entitled to and can fairly demand, and caring for their members in every way, as far as such associations can do. My next letters will be devoted to enquiring into the best means of effecting this, and to the enquiry what may be expected from co-operation.

London, July 21. ——— A MAN OF EXPERIENCE.

THE SHROPSHIRE COAL FIELD—No. XI.

THE LONG WALL SYSTEM, AND FACTS RELATING TO THE EARLY HISTORY OF MINING.

SIR,—The Kemberton pits, in the Madeley Wood Company's field, have just been completed, and the men are now engaged in making openings into the top coal in one shaft, and into the Pennystone in the other, the Pennystone being 130 feet below the top coal. These will be worked on the long wall system, which finds universal favour throughout the mining districts of Shropshire; first, on the ground that it is more economical in the working; and secondly, that it is more favourable for ventilation. It is a system, the men say, suitable to all depths, and to all kinds of measures of coal and ironstone which occur in this field. The seams of coal are often accompanied by bass roofs, shale bands, and clay partings, which usually furnish sufficient material for completing the gob, and thus relieving the pressure on the face of the work; other seams, too, are little injured during the working, and, excepting that a portion of inferior fuel is sometimes used, which might, perhaps, be turned to better account, the whole of the minerals is by this means extracted, whilst subsidence of the superincumbent strata takes place gradually, and by degrees. Ventilation by this means is most effective and complete; currents from the downcast shaft sweep through the roads and round the workings, which form the main air-courses, thus preventing all foul air accumulations. Such gobs, after consolidation, also make good roads for working other seams, an advantage to many of the coal proprietors of this district, who now find it necessary to re-open old works in order to obtain what our ancestors did not think it worth their while to get. These old works are generally near the outcrop, and it would appear that for ages ere the machinery and appliances for working the mines had attained the perfection they have, our ancestors, no longer content to obtain the minerals of the district by open work, did so by levels driven into the hill sides, or by little square shafts, the machinery consisting of a windlass or a gin. The quantity raised was small, as the means used for raising it were simple; the seams worked were those nearest to the surface, and when even the demand increased, and means multiplied for raising it, the different downcast faults, by which the beds were lost till deeper sinkings were made to reach them, for some time deterred the sinkers.

It is invariably found in this district that the earliest notices of coal mining have reference to portions of the field where elevations have taken place in the beds, and where the minerals cropped out at the surface, and in such places indications of mining operations of very early periods are often found. Old levels are discovered on the sides of hills, wooden tramroads, wicker-baskets, and wooden shovels are met with. An old work of the kind was opened some years ago at Oakengates, formerly a Roman station, called Usaconn, between Rutunium (Rowton Castle) and Uriconium (Wroxeter). The "Gentleman's Magazine," February, 1797, mentions the discovery of a hypocaust here; and indications are found among the ruins of Wroxeter that mineral fuel had been stored in some out-houses of the city. This is probable, seeing that during excavations appearances of coal were detected in hypocausts, then laid bare, and that Whitaker, in his "History of Manchester," remarks that it is clear the Romans used coal in this island. Ingots of lead, with the names of their Emperors inscribed, found in this country, show that lead was manufactured; and iron, Strabo tells us, was among the early exports of Britain. Numerous articles of this metal are found among the ruins of Uriconium, and Roman heaps of scoria elsewhere indicate the extent of the manufacture. Perhaps a plentiful supply of wood, the command of primeval forests, and ignorance of the full value of the boon, may be some apology for the long neglect of coal. Improvements in arts and manufactures, too, had not been made to herald from the night of ages this wonder working material—a material at once the acting and reacting cause of our national advancement. Still, for inferior purposes, by itself, or in combination with wood, coal was in use at least some half-dozen centuries since in this country, as grants, charters and documentary evidence of various kinds inform us; but from a disinclination to be driven from the beaten track, and a disposition to revolt when innovation or improvements beckon us to advance, its use was opposed by writers, legislators, and others. Laws were enacted, and proclamations issued; the smoke, it was said, would fill the land with epidemics. Mines having been opened, and coals having come into use near Shrewsbury, a learned M.D.—John Kaye, founder of a college at Cambridge, called after his name, wrote a great "Boke" (book) on one of these fearful epidemics of the time, called the "Sweat," which he says originated here, and then spread over the rest of England. In one part of the work he tells us that—

"On the 17th of the calends of May (April the 15th), when the kingdom was in full enjoyment of peace and tranquility, unmolested by any disturbance, a malady suddenly and unwonted to our countrymen stole upon Salop, a famous and fenced town, seated on the River Severn, which I attribute to unwholesome vapours arising from mining. So also (he adds) in many other places and regions of the world the fumes of sulphur or alumn rising from low pits kill those who work therein. We have also in the northern part of Britain certain coal pits, the unwholesome vapour whereof is so pernicious to the hired labourers that it would immediately destroy them if they did not get out of the way as soon as the flame of their lamp becomes blue and is consumed."

The nuisance, however, was doomed to become national; the pestilent evil was not to be put down; blacksmiths said that it softened their iron, brewers that it was serviceable fuel, and monks and feudal barons found that it was a cheap one for their kitchens. Coals were used in spite of petitions to Parliament, and, as more coals were used, more mines were opened. As an instance that Salopians were not much influenced by the doctor's reasoning, we give an entry in the Corporation books in the reign of Elizabeth, setting forth, in the quaint language of the time, a mining project, originated by the worthy inhabitants of Shrewsbury:—

"20 Dec., 1571 (14 Eliz.). They likewise be agreed that, yf there shall not amounte, to the some of 100*l.* of benevolence towards the syndinge of the colle pit that there shall be assessement of them which are not benevolent towards the same."

An extract from a manuscript chronicle tells us of the person by whom and the place where the search was prosecuted:—

"This yeare, and the X. of Marche, Mr. Richd. Gardner, of the towne of Shrewsbury, dyer, and free of the Drapers' Company attemptyd, and put in proofe to fynde coles about the towne in soondry placys, and in one place in especaill, called Emsterie, haz charde bye the sayde towne, he founde by his greate dyllgence and travell greate store of secole, the which is lyke to come to sutche commoditie both for riche and poore, that he ys not onely woorthy of commendacon and mayntenance, but also to be had in remembrance for ever."

——— JOHN RANDALL, F.G.S.

COLLIERY WORKINGS—HIGH ROYALTIES.

SIR,—I was pleased to find that Mr. Davies, the late proprietor of the Bullock's Farm Colliery, at West Bromwich, was considerate enough to correct an unfortunate misstatement relative thereto, made by my old friend, Mr. Randall, in the Journal. Mr. Davies has also made a slight error in the depth of the pit, on to the top of the coal, as I found by a copy of the section supplied to me by his agent some years ago, under Mr. Davies' direction; as I wanted the same to assist my honoured friend, Mr. Beete Jukes, in his Geological Survey of the district.

As a general rule Mr. Davies' observations on the high royalties in South Staffordshire are correct; but such is not invariable. I have minerals to let in this neighbourhood at a tenth royalty; whereas I have others to a large extent in Warwickshire, Shropshire, Derbyshire, Flintshire, and Lancashire for which I shall not recommend my clients to accept less than a royalty of a ninth.

I am aware that it is now a common practice to look down upon South Staffordshire as in a state of exhaustion and ruin; but, before allowing such an erroneous opinion to prevail, I would recommend an earnest study of practical geology. Years before the Lilleshall Iron and Coal Company proved the coal beneath the Permians in Shropshire, I exhibited a section before a parliamentary committee, in which I had calculated the depth to the first coal to within a few yards of the subsequent proof: therefore, *nil desperandum*.

Wolverhampton, July 21. ——— H. BECKETT, M.V.I., &c.

ON ACCIDENTS IN COAL MINES, AND SUGGESTIONS FOR PREVENTING THEM—No. IV.

SIR,—The Select Committee of the House of Lords, appointed to enquire into the best means of preventing the occurrence of accidents in coal mines, reported to the House, July 26, 1849:—Since the year 1835 the subject of accidents in coal mines had received considerable and effective impulse, and it appeared desirable to ascertain if the time had not arrived for the Legislature to effect some practical good, with the concurrence of nearly all persons concerned, by means of a judicious system of inspection. They had abstained from mere speculative investigations, and limited their attention to those cases which had been subjected to the test of practical application, and with respect to which direct evidence had been obtained from those whose professional acquirements and experience qualified them to be judges of their real value. The principal new designs for ventilation were Mr. Gurney's, for applying high-pressure steam to the ventilation of mines; the centrifugal fan, for effecting the same object, invented by Mr. Brunton; and the patent mine ventilator of Mr. Struvé, acting on the principle of a powerful air-pump.

The Committee state that the condition of the coal mines of this country, as regards ventilation, appears to be widely different, and, it is to be feared, for the most part seriously defective; better ventilation appears to be the improvement most needed, combined with a judicious use of safety-lamps. On the question of ventilation, Mr. Woodhouse gave evidence to the following effect:—Attention to the subject was becoming more general. Some colliery owners were not sufficiently alive to its importance. With more efficient ventilation the accidents at Ardsley and Darley Main would not have occurred. The most perfect way of ventilating is to divide the pit, if a large one, into districts, splitting the air at the bottom of the downcast shaft into as many divisions as necessary, and making as many returns separately (where that can be done) to the upcast shaft. Downcast should be to the dip, upcast to the rise, all the returns converging to the upcast from the men and horses. Deficient ventilation arises generally from want of power of the furnaces, and the form of construction, but principally from the airways being too small, and the air not distributed. Collieries under a good system of ventilation would be more economically managed than those with a bad system; though an increased expense might fall heavily upon small collieries, it is possible to improve them materially without much outlay.

Mr. Gurney's system of ventilation by high-pressure steam was first tried in Nov., 1848, at Seaton Delaval Colliery, under Mr. Forster's superintendence. With two upcast pits and two furnaces, 10 feet by 5 feet each, the quantity of air obtained was 53,000 cubic feet per minute. With steam-jets in an upcast pit, 8 feet diameter, the quantity was increased to 85,000 cubic feet per minute. There were 25 jets, ¾ inch diameter; pressure of steam, 35 lbs. An underground engine, with its boilers, was at work during these trials. The consumption of fuel was stated to be much greater for steam-jets than for the furnace, in proportion to the quantity of air circulated, but the experiments were not clear and conclusive on this part of the subject. Steam-jets are applicable where the furnace is not always safe; that is, when the boiler is placed on the surface, and the steam brought to the bottom of the upcast in pipes. Mr. Gurney stated it was not worth consideration whether the boilers were placed underground or not, so

little power being gained by the heat of the steam and rarefaction. If by this it is meant that the jets may be as effective near the top of the pit, the steam acting only by its impulse, we should be inclined to think to the contrary, that the jets should be at the bottom, and the steam, in giving out its latent and sensible heat, will materially assist the ventilation. When the steam is brought down from the surface in pipes to the bottom of the upcast, the heat to be given out is absorbed in the steam: what is not utilised under the boiler is lost. There is a further loss from condensation and friction in the steam-pipes; this seems to be against the steam-jet, as regards economy of fuel, but, as before observed, this application of the steam-jet is attended with less risk than the furnace system, and the power may be increased greatly in most cases by increasing the pressure of the steam.

Mr. Brunton applied the centrifugal fan this year (1849) to the ventilation of mines. He stated that the pressure at Haswell Colliery was 8 lbs. per square foot=1½ inch of water. He produced by his fan, at Mr. Powell's Gellygaer Pit, 2 inches of water, with 90 revolutions per minute. The fan was placed horizontally over the upcast; it was 22 feet diameter outside, having 25 radial arms, 6 feet long, the lower edges sloped upwards; mean diameter of compartments, 16 ft. When the ingress of air was shut off at the bottom of the downcast pit, in less than five minutes the whole of the colliery was rarefied to the extent of nearly 3-10ths of an inch of mercury=4 in. of water. When the downcast is shut off, the engine having less resistance from the air arising from the mine, its power is then turned to an increase of rarefaction by increasing the velocity of the drum. The exhausting process, whereby the whole of the mine may be subjected to rarefaction to the extent of ½ in., or more, column of mercury during the absence of men and lights, produces on the gases of the mine the same effect as on a fall of the barometer. As a means of providing a healthy and safe atmosphere in mines, the inventor looked with great confidence to the capability of this machine to draw off by rarefaction foul air from the goaves during the absence of men, and the introduction of fresh air before work was resumed, when the mine will be in a state of extraordinary purity. Had exhausted the mine with the fan frequently, to the extent of 7 or 8 in. of water.

Experiments at Gelly-gaer Colliery, with Mr. Brunton's fan:—

Revol. per min.	Inches of water got.	Pounds per sq. ft.	
48	0·55	2·86	
93	2·10	10·936	18,000 cub. ft. of air obtained
99	2·50	13·02	
132	4·20	21·873	with downcast closed.

If driven to 210 revolutions per minute would produce a rarefaction of upwards of 50 lbs. per square foot=9·6 in. of water, ingress being closed. If unconnected with any air-course—mere displacement—it would discharge more than 800,000 cubic feet per minute. The engine to drive this fan had an 18-in. cylinder, 4½-ft. stroke, 30-lbs. pressure, condensing. The fan might be driven to 150 revolutions per minute with safety. There is no record of its efficiency with respect to other fans or other modes of ventilation. It is now superseded by fans of various construction. The principle of exhausting mines by machinery was recommended by Mr. Vivian, as well as by Mr. Brunton, who gave evidence as to its practicability.

It will be seen from the above experiments that rarefaction, as shown by the water-gauge, is no measure of the ventilating power of any machine or furnace (as Mr. Brunton and others would seem to suppose), but indicates the difference of density of air in the downcast and upcast pits, and may be increased by closing the ingress at the downcast, by obstructions in the air-ways, and by a great extension of air-courses. The air before, or on, passing the ventilating power is equally rarefied in a given mine, with the same quantity in circulation, whether the power employed be the furnace, steam-jets, or machinery. Suppose a mine to have 10 miles of air-passages, dimensions 6 by 6 ft.=36 ft. area, the weight of air in those passages of ordinary density, and at 60° temperature, would be about 64 tons; the friction of this air on the sides and turnings of the passages, and the velocity at which it is moved, gives the resistances and the power required to overcome them; the power must be increased as the square of the velocity.

We next notice the mine ventilator of Mr. Struvé, which was first erected at Eaglebush Colliery, near Neath. Dimensions: 2 cylinders 12 ft. diameter, 8½ ft. high, could be worked with either 4 ft. or 6 ft. stroke, according to the crank; area of top of cylinder, 113 ft.; cubic contents with 6-ft. stroke=678 ft. At 8 double strokes per minute the machine should pass 21,696 cubic feet of air per minute, but owing to rarefaction from constricted passages in the mine and frictional resistances, and constriction at the valves, this quantity of air would have to be reduced to the density of the ordinary atmosphere at the time to give the true result. The measurement by the machine would in this case indicate more air than would be found passing at the downcast. The Committee particularly pointed attention to the successful application of Mr. Fourdrinier's invention, for arresting the descent of the cage in case of the rope breaking, which seemed to promise a valuable protection against this description of danger. The principle of action is that of the wedge, passing between cross bars on the cage and the guides; the wedges are attached to the end of levers resting on the top of the cage, and are brought into action as soon as the chains at the other end of the levers are slackened. A part of the invention consisted of a disengaging hook, but this was much objected to, and was not put into practice. It was suggested at the time to introduce two strong beams of timber at the top of the head gear to stop the cage, and break the rope in case of overwinding; the wedge apparatus would then come into action. Contracting the distance between the guides at the pulleys, and having one or two sets of catches to arrest the cage on its descent, would be a means, in conjunction with the others named, of preventing this kind of accidents, which it is so desirable to avoid. Several witnesses spoke in favour of this invention, and it was put to several practical tests at Usworth Colliery. Mr. Peace considered the apparatus perfectly useless, because sufficient care ought to be taken by managers to keep their ropes in proper condition, and the apparatus would be liable to get out of order, and not come into action when required.

Mr. Gurney had discovered a new method of extinguishing fires in the coal underground. The usual way when the coal is on fire is to stop off locally all the passages around the fire by air-tight stoppings; if this cannot be done the downcast and upcast pits must be sealed up air-tight. It is found by experience that air is drawn through fissures in the coal or strata, and it is sometimes impossible to extinguish it in this way. On opening out the works too soon the fire is still in existence, and explosions often take place from the gas which has been distilled from the burning coal mixing with atmospheric air. When this occurs water is let into the mine. This is attended often with great expense, in extracting it again from the mine, and causes much delay and damage to the coal and workings. By means of a furnace and steam jets, constructed to produce nitrogen and carbonic acid, Mr. Gurney successfully put out a fire at Astley Colliery. The furnace was 4 feet square. Leading from the ash-pit, quite close otherwise, was a pipe 13 in. in diameter, led into a close iron tank half full of water, and dipping into it; another pipe, also immersed in the water, led from this tank to the downcast stopping; each pipe had a jet of high-pressure steam in it. The upcast stopping had a similar sized pipe through it, and an exhausting steam jet, assisting the compressing jets. The fuel was small coal and limestone. The amount of nitrogen and carbonic acid sent in was 6000 cubic feet per minute, which had the effect of extinguishing the fire in six hours. Another fire at the same colliery was extinguished shortly afterwards by carbonic acid gas, made from limestone and sulphuric acid at a small expense.

The improved safety-lamp of Dr. Clanny was brought under the notice of the Committee: this lamp is now extensively used in coal mines. The apertures of the gauze were made as high as 1296 to the square inch, the flame being surrounded by a cylinder of thick glass. The air for the combustion of the wick enters through the wire gauze, and descends to the wick. When the lamp is placed in an explosive mixture the gas inflames in the upper part of the lamp, and deprives the wick of oxygen, which instantly goes out, and the blue flame goes out directly afterwards in a quiescent manner. The objection made to this lamp was the brittle nature of the glass, and its liability to break or crack; but the light it gives is admirable, being about four times stronger than that of the Davy.

It was stated by Sir H. de la Beche, with reference to ventilation, that large collieries had the benefit of better agents, and for the most part had their mines in good condition, but these do not form the great mass of collieries: on this it may be remarked that large collieries produce the greatest loss of life by explosions, and there seems to be peculiar dangers in bringing large masses of men together in one mine, which may arise from the want of that perfect supervision that is imperatively needed in coal mines. In mines of such extent an increase in the number of overmen, who have the charge of their daily superintendence, is a matter for serious consideration, and additional overlookers for lamps where they are in extensive use. Barometrical changes in the atmosphere do not affect the ventilating powers of either furnaces or machines, otherwise than indicating an increase or diminution in the density of the air, in the latter case liberating gas to a greater extent in the mine.

Thermometrical changes affect ventilation in this way—when the temperature at the surface is below that of the mine, a natural ventilation is caused, which assists the furnace, or other mechanical means; when the temperature on the surface is above that of the mine the ventilation by furnace or machine is retarded, according to the difference of temperature in the two columns. The winds in this country blow most frequently from the south and west quarters, the barometer is generally lower, and the thermometer higher when the wind is from those quarters, so that a surplus power of ventilation is required to make up any deficiency from those natural causes. The relative efficiency of the various systems of ventilation has not yet been determined; we would suggest that great benefits would result from a commission of scientific and practical men appointed to make trials in a mine (obtained for the purpose), on the different systems of ventilation, on appliances for preventing overwinding or accidents in shafts, the merits of safety-lamps, of the exhausting process, and of the various systems of working coal with respect to safety, and obtaining a large proportion of the mine.

The Committee remark that improved education would have a tendency to induce greater caution among the workpeople, and to raise the qualifications of those who, as subordinate agents in the management of a mine, are charged with the greater part of its effective superintendence, but it does not appear to be the opinion of the practical witnesses that its absence has much perceptible influence upon the liability to accidents.—*July* 15. M. B. GARDNER.

EXPLORATION OF A PORTION OF THE LAKE HURON TERRITORY.

A Summary of Facts and Observations on a portion of the Lake Huron Territory, traversed by an Exploring Party dispatched in the Summer of the Year 1835, *by order of the late Field Marshal the Earl of Seton, when acting as Lieut.-Governor of Upper Canada.*

The writer was attached to this party as Geological Observer, with two surveyors and twenty labourers, under the temporary command of Capt. Carthew, R.N., who had the direction of the exploration, the object of which was chiefly to ascertain the capabilities of the country traversed for settlement, and the direct rout of exploration was on a straight and clear path cut through the woods from the township of Mara, on the eastern coast of Lake Simcoe, in the direction of Lake Nipissing.

It is well known that the agricultural character of every country, particularly if it be a new one, is greatly influenced by the class of rocks which prevail in it, for the soils which cover them, or are found in their vicinity, are in general the result of their disintegration and decomposition. The general rule, however, is not without exception, and it occurs when a diluvial or alluvial action has swept from remote regions a soil foreign to the lands it is left upon. Those rocks of a thoroughly crystalline structure, such as granite, gneiss, sienite, greenstone, and hornblende schist, are usually associated, in all countries where they occur, with soils of an inferior description, resulting in their disintegration and decomposition, and such rocks, with one limited exception, are those which occupy the unsettled portions of the lands we traversed. The exception alluded to is limestone, I believe, of the Silurian era, which may be traced (at long intervals) from Lake Winnepeg to the Straits of Bradore, skirting, overlying, and abutting against the more ancient rocks, which seem to bar its progress to the northward in Canada, in which direction we lost all traces of it, eight miles from the N.E. corner of Mara.

It is true that good soils sometimes have their origin in the decomposition of sienite and disintegration of greenstone and the hornblende schists, but, judging from what I have observed in Canada, its felspathose rocks are not liable to decompose, and although the amphibolic rocks are liable to disintegrate, the soil resulting is usually of too ferruginous a character to be good. Decomposing felspars seem to be, in a great measure, confined to tropical, or nearly tropical, countries, such as China and Ceylon, where they abound. If this be a fact, is it owing to higher temperature, greater alkalinity, or both, or has disturbance something to do with the question?

These crystalline rocks and the hills and mounds (mountains are never seen) they compose obtain little altitude in the country traversed, are noticed usually at low levels in relation to the waters which traverse or intersect them, are rarely 50 feet above such waters, and never 100 feet. The crystalline rocks of Europe sometimes attain a height of 10,000 feet, and are usually elevated. In North America, with the exception of the Rocky Mountains alone, I believe, we are not acquainted with any which exceed 4000 or 5000 ft., and they usually fall far short of this. In Canada Capt. (now Admiral) Bayfield measured the highest pinnacle of the Gaspésian chain, as seen from the Gulf of St. Lawrence, and found it to be 3700 feet above the sea, which appears to be the highest altitude he has noted in Canada while exploring its waters. In consequence of the little elevation the rocks attain in the line of exploration, the country they characterise is comparatively low and level, which, joined to the fact that it is often covered with hard woods occasions the hasty observer to conclude that the quality of the lands they are found upon *must* be excellent, if, however, recourse be had to the agricultural probe (an iron instrument, like a carpenter's gouge, pointed at the lower end), as was always done by us, the greater portion of these lands will be found to be otherwise.

The mere topographical outline of a country has often deceived, and will continue to deceive, persons who seek no other sign of its agricultural character. In forming a just estimate of this character we can neither depend upon level nor quality of timber. We must probe and examine the soil itself. Repeated explorations in Canada have convinced me that a growth of hard wood on land is by no means a positive indication of a good soil; neither does its absence necessarily imply the reverse. Hard timber, of a good size, was frequently and abundantly noticed by us growing within 6 in. of the surface of the rock, in a soil of the most meagre quality. The luxuriance in timber which such soils sometimes exhibit may be owing to the renovating influence which woodlands experience in consequence of shade, moisture, and the autumnal fall of the leaf. Removed from such influences they would become barren. There is also another view of the subject to be taken. A good soil which the tap root of a tree may reach and derive nourishment from, may be too deep for superficial agricultural purposes. Again, a very fertile superstratum of soil may be too encumbered by decomposing vegetation and underwood to allow of the growth of fine timber.

The predominating soil of the country traversed is a meagre red or yellow ferruginous sand, varying in depth from feet to inches, often not exceeding three of the latter dimension, and not unfrequently absent altogether, leaving the rock bare but for its hoary covering of lichen. Clay, or clayey loams, were but rarely seen, and when noticed their usual position was either in some of the swampy valleys between the rocky hills and mounds, or forming alluvial deposits on the banks of rivers, often deeply covered up by a siliceous sand. This red and yellow ferruginous soil is, I think, derived in a great measure from the disintegration of the greenstones and hornblende schists, which so greatly abound in the country, and which readily yield to watery and atmospheric influences. Towards the termination of our exploring duties, and while making some lateral excursions to eastward of our direct path of exploration, we met with some superior lands, a remark which may serve to qualify what has been written in the beginning of this paragraph. The country is traversed by lakes and swamps, and they are characteristic of a country in which crystalline rocks prevail, for such rocks often allow of no percolation to the waters which fall upon them, but shed them to their bases, where dammed up they stagnate, and become nearly, if not entirely, currentless. Most of the lakes, however, in question communicate by rivers with Lake Huron, by which alone the country is rendered readily accessible in its present state to private explorers. I believe that many of the lakes, swamps, bays, and portions of rivers owe their existence to the disintegrating character of the predominating greenstones and hornblende schists, for on many of them, particularly conspicuous on the rocky islets of Lake Huron, the erosive action of water is not only very visible but very curious.

All the waters met with by the exploring party fall, either directly or indirectly into Lake Huron, consequently the "Dividing Ridge," which throws all the waters eastward of it into the Ottowa, was not passed. In our latest eastern excursions up the "Shunaga," river from its great lake of the same name, we reached within a day's journey this "Dividing Ridge," and were greatly tempted to cross it, and descend to the Ottawa, but the lateness of the season, and the want of a fresh supply of provisions, prevented our doing so. In my ascent of this river in a canoe I met with excellent and extensive tracks of good land, and the same were noticed by Messrs. Richardson and Hawkins, the surveyors before alluded to, who were at the same time exploring right and left of me on opposite banks of the same river.

The abundance of water communication from Lake Huron renders the country we traversed very accessible to canoes, by making portages between rivers and lakes, to avoid the frequent obstructions in the former, which arise from rapids, falls, &c. Were it not, indeed, for these the rivers might be ascended in steamboats, being usually both wide and deep. The highest observed latitude we reached in the direction of Lake Nipissing was 45·42°, beyond which for eight miles the land bore a very unfavourable aspect, being little better than one continued swamp, which circumstance, together with the lateness of the season, the want of provisions, and the unfavourable reports we had received of the country stretching further to the northward, induced us to give up further exploration in that direction, and terminate our operations by making the lateral excursions before alluded to whilst waiting for the fresh supply of provisions on their way to us from Lake Huron, and the canoes to take us thither on our return to Penetanguishine. F. H. B.

APPLICATION OF PETROLEUM OILS FOR HEATING STEAM-BOILERS, AND PRINCIPALLY THOSE OF MARINE ENGINES—No. I.

SIR,—I beg to call your attention to the question of employing petroleum for steam fuel, which has occupied the attention of mechanical engineers of all parts of the globe, and lately has been made the object of a special study by M. VERSTRAET, chemist, 82, rue Francois-Miron, Paris. Recently a communication on this subject, made to the Academy of Sciences by M. Henri Sainte-Claire Deville, proves that the Emperor of the French takes great interest in the solution of this problem. The idea put forth by M. Verstraet has been maturely and thoroughly studied; and much good result is to be expected from his ingenious combination of theoretically efficacious, and also practical means of working. His very excellent idea of causing the current of supplied air to pass over the surface of the hydro-carburets, in order to suppress the tension of their vapours, and to convert this air immediately into the state of comburant and combustible at the same time, seems to be a most successful one. The immense sources of petroleum and other mineral oils discovered many years since in a great number of countries have awakened the attention of men of industry and statesmen to the employment of these oils for steam-engine—and especially marine engine—boilers. Yet, still the use of this combustible seems to make very slow progress, especially in the Navy. For several most important reasons, Governments have acted with the greatest reserve on this point. These are the principal:—

1.—Dangers presented by the handling of these oils, so easily inflammable; dangers which become terrible for ships at sea, and especially for war vessels exposed to the effects of shot, which might set fire to their reservoirs.

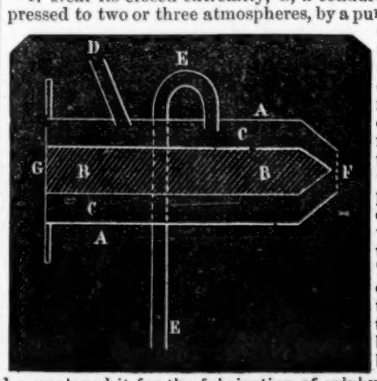
2.—The carbonated gases which, being incessantly disengaged by mineral oils, can give rise to detonating gases; and, besides, entail considerable loss, increasing the cost of the liquid combustible, and depriving it of its most calorific elements.

3.—The penetrating odour of the petroleum, the emanations of which, invading the best-closed compartments, and injuriously affecting the respiratory organs, tend to render it intolerable to remain for any lengthened period on board, especially between decks.

4.—Lastly, as these oils are very rich in carbon, if the air necessary for complete combustion were not furnished to them in sufficient quantity, the tubes and the smoke boxes would be choked up by all the carbon which had not been oxydised. Thus, the consequent and often repeated scourings would render impracticable the use of petroleum and other analogous products in marine engines, which ought to be able to perform a considerably long service without repair or stoppage. The composition per 100 parts of petroleum oil is as follows:—Carbon, 83·65; hydrogen, 16·35. For their complete combustion, the 83·65 kilos. of carbon require 223·06 kilos. of oxygen; the 16·35 kilos. of hydrogen require 130·80 kilos. of oxygen; these furnish 306·70 kilos. of carbonic acid and 147·15 kilos. of water. Now, the weight of a litre of oxygen, in the normal conditions of pressure, being 1·4298 gramme, the 355·86 kilos. of oxygen will be contained in 1537·85 kilos. of air, representing 1189·180 cubic metres, the density of air being 1·2932 gramme per litre, and the composition being (by weight) 23·01 oxygen, 76·99 nitrogen, in 100 parts.

The following are the principal inconveniences to be avoided, and the means proposed for that end by M. Verstraet:—1. *Inflammation of the Oils by Shot:* It has been proposed, to guard against this danger, to surround the reservoir with a double casing, and to fill up the intervening space with earth or water; but these substances would not present a sufficient obstacle except they existed in considerable quantities, which would be impossible, on account of their weight. A substance eminently calculated to lessen the effects of shot is sawdust, strongly impregnated with a concentrated solution of chloride of calcium, which can be procured in great quantities in manufactories of bone-gelatine, and where it is of no value, and put to no use. To render the sawdust still more incombustible it is calcined in a closed vessel, so as to deprive it of all its volatile matters, and we obtain a black, very light substance, perfectly uninflammable, and capable of absorbing the oils, and preventing all danger if the reservoir happened to be injured by shot.—2. *The Volatising of the Petrol,* resulting in danger of explosion and great loss of combustible. This inconvenience, the gravity of which is indisputable, is even more easily got rid of than the first. M. Verstraet causes the air supplied to the furnaces to pass over the surface of the oil in the reservoirs. This air, introduced by a large chimney, takes up all vapours or gases emitted, and carries them to the furnace. By this disposition there is never any pressure in the reservoirs, whatever be their temperature.

To obtain this result, a very simple contrivance is made use of, consisting, as shown in the accompanying sketch, in vertical section, of a hollow, bronze tube, A, terminated by a truncated cone, F, pierced with holes for the subdivision of the air. Into the tube C there leads —1. Near its closed extremity, G, a conduit, D, supplying air, compressed to two or three atmospheres, by a pump worked by the engine of the steamer.—2. Near its open end, F, another conduit which communicates with the petroleum reservoir. The draught occasioned by the current of compressed air of the tube D draws, by the tube E, the air, which, in passing over the oil, becomes charged with its vapours, and conveys them to the furnace. This apparatus, the form of which may be varied, the principle remaining the same, was employed by M. Verstraet with the best results in 1862, when he employed it for the fabrication of sulphuric acid, without leaden chambers, from sulphuretted hydrogen. Applied to the combustion



of petroleum oils, it will not allow any escape of either explosive gas or bad smell, and will prevent any loss of oil from evaporation.

The system just described, while it avoids the dangers feared in the Navy, will permit the necessary air for the furnaces to be enriched by a considerable quantity of light and carburetted gases—in fact, among the various carburets of which petroleum is composed, some boil at only a few degrees above freezing point; it is to these latter that the oils owe their property of emitting so easily gases at ordinary temperatures; others, in the proportion of 1-6th to 1-7th, boil regularly at 30° Centigrade, so that the air passing over the oils can be most easily charged with 5 to 10 per cent. of light oils, and this quantity can be readily increased, either by a mechanical agitation of the oils, or by an elevation of the temperature. C. H. DOWLING.

Paris, July 18.

DELUSIVE SLATE QUARRY CONCERNS.

SIR,—I think Mr. Jenkins is doing good service in calling attention to some of these—so disgraceful to their concoctors, and so disastrous to all concerned in them. Well may intending investors be suspicious, when they find the late manager of a well-known slate company giving flaming accounts of worthless concerns, and a company persistently year after year using your columns to advertise 5 per cent. dividends when they had never since their beginning fairly earned a single penny. Your readers of last year may remember what trouble it took me to expose this fraud, and how hard its authors died. I do not name the company, as I promised not again to hold them up by name, unless forced thereto by some fresh offence of the same kind.

Of the two smallest slate quarries Mr. Jenkins mentions I do not even know the exact locality. I have never seen the great Moelwyn, but from what I have heard dare say his account of this quarry is not far from the truth. But of Gorseddan I do know a little, and mainly pen this note to prevent a tone of inaccuracy and exaggeration from lessening the good effect of his exposure to those acquainted with some of the facts. What he says of the utter failure of this quarry after a very heavy expenditure in clearing and opening, and making a branch railway in a most complete and expensive manner, is pretty nearly the exact state of the case.

But he is not exactly correct in what he says of the slate formation and the chief causes of failure. A large quantity of merchantable roofing slate was sold from the quarry. The quality (though certainly not at all near best quality) was, when well sorted, of stout slate, well suited for the Scotch and North of England markets, and commanding there the full prices of similar qualities. What Mr. Jenkins saw at the siding at Tremadoc were rejections after sorting for shipment, and these certainly looked rough enough; but, though there was in the hill a large deposit of slate rock rather improving in quality, further in, as the cover was deeper, there were no regular overlie, underlie, or working joints, as in a regular paying slate vein. The rock stood up nearly perpendicular, running by the transition of bastard into the hard covering without joint or separation.

Hence, there was no regular roof—even tunnelling was a matter of cost and difficulty; and working under cover, without proper back or foot-joints impossible. The slate was won by bringing down huge masses in open working, and taking away the portion of working slate. All that good quarrying could do to lessen the cost of this was done, and a large pneumatic drill used to put in larger blasts than could be done by common jumpers. But, after all, the slate was won too dear to pay; and the farther back they went into the hill the worse the case was, as deeper top covered the slate. All who opened the quarry had the sincere sympathy of those who knew the facts. The company were men every way of the highest standing; their manager a first-rate man in his way, and the Welsh quarry foreman one of the ablest, most honest men I have ever seen in a quarry. But all were too sanguine that the rock would improve, and the paying point be turned, if they only went on and opened boldly. It was a most singular case of overlooking laws of Nature, and obstacles that were fatal, by those who ought to have known better, that I could not have believed, had I not seen it. But one and all concerned, though too sanguine and self-deceived, were, I am convinced, too honourable willingly to have deceived others. A MAN OF EXPERIENCE.

London, July 20.

REFORM IN BRITISH MINING.

SIR,—Mining as a business and adventure is almost lost sight of; complaint is heard from all quarters—that there is nothing doing, dividends on the decrease in the old mines, and nothing new springing up to take their place! A few years ago the present price of tin and copper was thought to be good enough, and mines were paying very large dividends every two or three months; but, the fact is, the mines now in existence, not only in this country but abroad, with few exceptions, are very deep, and consequently very expensive to work, and no new mines, as formerly, have lately been discovered. The present generation are not a discovering race of mining men—jobbing only is the order of the day, and no new prizes, consequently, can or will be found. Our forefathers were constantly driving levels of discovery, and no advantage was taken should a discovery be made, or the sett be nearly expired. Not so lately: every undue advantage is taken by some landlords, or their agents, of an adjoining field, if the lode were found to be rich near the same, or the grant given to some period. And so speculation is at an end; consequently no new mines can be found. New discoveries near the surface are the sort of mines to pay the investors. As mines deepen so the quality of the metal decreases in the ore: all the deep mines of the present day to wit.

The dues, or royalty, paid by our British mines are ridiculous, and drive all enterprising men to seek their fortunes abroad, so that in a few years no one will be found to speculate in anything but foreign mines; although I believe there is much good to be done at home. With a new order of things, such as a reduction in the dues, and larger setts granted, matters might come round again; but delay is dangerous, as there is a limit to consumption, but not to production, the price governing the supply, and every year the facilities are greater and greater.—*Penzance, July* 20. ADVENTURER.

MINING IN EASTERN NEVADA—No. II.

SIR,—The El Dorado South has developed some extraordinary chloride deposits, at a distance of some 200 ft. south of the first incline. For purposes of better ventilation, as also for development, the superintendent, Mr. W. F. Leon, started an incline 200 feet from the first one, where immediately at the surface, and continuing down as far as yet reached, a distance at present of 40 ft., he struck into a chimney of the richest and most concentrated chloride ore ever yet discovered in this State. The mass of vein matter seems strange indeed at first sight, being a combination of carbonate and oxide of lead, oxide of iron, decomposed lime, and traces of oxide of antimony, with a large proportion of chloride of silver, and some silver in the native state. Assays of this silver-bearing mass, ranging from $250 to $10,000 per ton, the latter of course, from select pieces. A lot of the ore reduced at the mill gave $42,385 per ton. The proprietors, Messrs Mullin and Leon, are making money fast from what ores they are having reduced; but they having no mill of their own, and there being no custom mill in the district, are obliged to accumulate their ores. They have now fully 250 tons on their dump, of not less than $300 per ton.

Antonio, the Mexican, has erected a small four-stamp mill; he is reducing the best class of the ore from the Arizona Mine, and is taking out daily from $500 to $600 worth. Owing to the great want of a custom mill at Belmont all operations outside of the Combination Company's High Bridge, Feisview, El Dorado, and Arizona are at a standstill But, as parties are now engaged in putting in a custom mill, we look forward to lively times by August and September in Philadelphia district. The Silver Peak Great Salt Basin Mining Company have started up their 20-stamp mill at Red Mountain, and, from the milling tests hitherto made, grand results are looked for. Their first week's clean up gave $55 per ton gold. They are reducing their ores for the gold only, as no appreciable amount of silver is contained. They crush 40 tons per day. Col. Catherwood will have his mill in full blast by July 1 next.

The mines at Cortez district are attracting much more attention at present than heretofore. The very splendid development made in the St. Louis and Garison ledges by the operations of Page and Winban during the past spring has created much excitement. They are continually hauling their ore from these mines to Austin, a distance of 95 miles, and making from $10,000 to $15,000 a month clear profit. Of course, none but the highest grades can be so handled. They are accumulating an immense pile of second-class ore at their mines, of the assay value of from $125 to $150 per ton. Work has been resumed on the Taylor and Passmore Mines, in that district, as also on the Gill claim, and many others, all intending to accumulate their ores until a custom mill is built, which is now contemplated for that district. The richness of the ores, and its close proximity to the railroad, which will pass in November next within 18 miles of this district, will give to Cortez district a standing second to none in Nevada. The New Ark Mill and Mines, of the Centenary Company, started up in April last; they are doing splendidly, turning out from $1800 to $2200 per day. Their mine developes well, and is turning out much more ore than the mill of 20 stamps can reduce. An immense excitement has been got up over some new discoveries th at have been made during the past spring in the district of White Pine, 25 miles east from New Ark. The ledges are large, and contain chloride of silver, so far as sunk on, of excellent richness. Chloride ore has been found here in such a form as has never before been seen in Eastern Nevada, it being in nugget form, from the size of marbles to that of flat slabs, weighing from ¼ lb. to 6 lbs. and 7 lbs.; this is found on the surface, the drift and wash, and in the interstices of the ledges. A lot of this ore, smelted by the writer, gave $4·003 per pound. A furnace is now in course of erection by the writer on the ground, to smelt all such ores of that district as are adapted to that process. The Social and Stepto Company, Eagan Canon district, are forwarding a 20-stamp mill to their mine at Eagan to be immediately erected, for more extensive operations on their property. Four years' experience of constant work on their mines, and the continual running of their old defective 5-stamps mill, convince this company that mining business is and can be made profitable, if gone into understandingly, and conducted inteligently and honestly. The Knickerbocker Company, at Jone, have again started up their mill, with some 500 tons of first-class ore on hand, of the value of $225 per ton, besides 600 tons second-class, ranging from $70 to $90 per ton. A new 10-stamp mill is just completed in Washington district by a Philadelphia company, and will be running by July 1.

The Hunt Mill, San Antonio district, purchased by Mr. T. F. White, has been removed to Northumberland district, 20 miles from Belmont. Development still goes on at Hot Creek district, where the miners would all be making money if they had mill capacity to reduce their ores. Since the burning down of the Old Dominion mill there is only the 10-stamp mill of Gould and Co. to reduce ores at. Reveille district still keeps up its reputation for rich ores; but the want of water there as well as wood keeps the district back, yet many of the miners there are making money by hauling their ores to Austin, a distance of 140 miles.

Pharanaget district, like many others, managed by inexperienced men, got their mills erected before developing their mines, and, as a consequence, the mills are now idle, awaiting the extraction of ore. We have a much greater influx of experts this spring than ever before. They are here in the interest of capital, silently and quietly examining the merits of our mines for speculative purposes. With a railroad passing close north of us, and another therefrom through our midst to the Colorado River, south of us, for which a charter has been already granted. Our country proving, has it has done, second to none in the world for the richness and extent of its mineral deposits, with its soil proving, as it has in the past two years, suitable to the production of all manner of cereal and vegetable products, affording the best cattle raising and fattening grass ranges even to its mountain tops, a climate unsurpassed for its mildness, and but seldom equalled in so high a latitude—with all these advantages, there cannot be a second opinion as to the future of this country amongst reflecting and practical-minded men.

And, as already stated, the days of wild speculation having passed, and a course of system and method, with confidence, being established, not further in the future than from one or two years hence this section of Nevada will present to the world such a bullion product as never could be even throught of as coming from any one section of the globe. I claim not the power of prophecy; but this I state honestly and understandingly, knowing that the future and facts will bear me out in the assertion. JOHN R. MURPHY,

Austin, Nevada, June 10. —— Mining Engineer and Metallurgist.

TIN-BEARING ELVAN COURSES.

SIR,—Referring to the tin-bearing elvan courses forming the subject of Mr. Thomas Thompson's letter in the Journal of July 11, you will kindly allow me to remark that he has spoken with great moderation of the unusual advantages to be derived from their working. I have been a shareholder in Royalton almost from its commencement, and ever felt satisfied that as the open cuttings were extended profits would greatly increase. Now that the lode in the 25 fm. level is being operated upon, it will be found that in consequence of the much greater richness of the stuff the returns of tin will be very materially increased, and as the ground is laid open the cost lessen. The interest of the local shareholders has been purchased by experienced parties, who will conduct everything with spirit and economy, and so ensure a prosperous future for the mine, and the supply of tinstuff being inexhaustible, it offers a splendid opportunity for the investment of capital. I have not the least doubt that more than 100*l.* per month profit can be readily given with the present plant, and more than doubled after awhile by the addition of a greater number of stamps; and in this opinion I am supported by one of the most cautious and able agents in the locality, engaged in a similar concern, who visited the mine with me about a fortnight ago.

The same remarks apply generally to the Terras Mine, the two elvan courses being very similar, and producing about the same quantity of tin, and both setts containing tinstuff enough to last generations. In Royalton the water charges are light, there being no more water than is required for dressing purposes; while in Terras there is not even the cost of pumping this, there being a stream running through the sett amply sufficient for the wants of the mine.

The fact of similar concerns being purchased and worked by gentlemen engaged in the tin trade proves that the prospects of the trade are healthy, and the value of the two mines I have spoken of established by the last return of tin from Mulberry, a mine near by, amounting to over 9 tons for the month, and giving a profit of from 200*l.* to 300*l.*, from stuff producing a percentage of less than half of that obtained from Royalton and Terras.

I have often stated my belief that within a short space of time a number of these open quarries will be at work in the St. Columb and Lanivet districts, giving employment to a large number of hands, and regarded with great favour by the public as investments free from risk or speculation.

East Harptree, July 22. —— WILLIAM DERRY.

WEST CARADON MINE, AND ITS MANAGEMENT.

SIR,—The Journal of July 11 contained some most unusual, and certainly most uncalled for, remarks on a mine agent, at the West Caradon Mine meeting. Probably the agent on whom the attack was made may treat the matter as unworthy of notice, but it is due to the public that the matter should not pass without remark. If Capt. Johns be such a clever manager as he is said to be, and has been *ten years* stoping away the ore previously discovered without during this long interval finding a solitary bunch of ore in addition, surely it is no disparagement to a man because he did not succeed in finding a good one in as many *hours*. But let us see how far his suggestions succeeded. If I understand it aright, great expectations have been held out to the shareholders at the junction of Vivian's and Allen's lode; to arrive at that point an enormous expenditure of both time and money had already been incurred in sinking and driving before this inspector was called in, and that *ten months* more at *least* must have elapsed ere this junction could be seen by the course adopted. The said inspector suggested a mode of proving this in *two* months at two different points, and at less than *one-fourth* of the cost estimated by Capt. John's method; so that if the lode be found worthless at the point in question, as in the level over, any further loss might be avoided, but if found valuable the ground could be opened out in *one-half* the time it could be by the method then adopted. The suggestions of the inspector, it is said, have been carried out, and failed. Failed in what? The only way in which I can understaud the *failure* is, that the lode has been seen at the junction and found worthless; therefore, the failure is indeed complete in reference to Capt. Johns's opinions, but is a decided *success* so far as the inspector is concerned, and the shareholders can now see what the result of a further 12 months' prosecution of the bottom level would have been, and how easily the same result could have been obtained years since without sinking even an inch of the last 10 fathoms. It seems difficult to understand how anyone can be so sensitive about the inspection of West Caradon, unless they are conscious of there being a "screw loose." The Gonamena people have pointed out a piece of long-neglected ground to Capt. Johns, which is, no doubt, mortifying to him, but at the same time the thanks of the shareholders are due to them for it. —— A MINE ADVENTURER.

THE NEW BELDON LEAD MINING COMPANY (LIMITED).

SIR,—Please to allow me space in your valuable Journal to give a reply to Mr. Remfry's remarks on the 4th inst., on my report on the Beldon Mines, relating to the value of a working in the Coulsills, in the Derwent Mines. I beg to state his attack is quite uncalled for, for when the errors are corrected they stand thus:—*Stope* instead of forehead, and little *limestone* instead of 4 fms. limestone. And the stope alluded to was estimated by Mr. Remfry to be worth 8 tons of ore per fathom, a few days previous to my report being written on the Beldon Mines; and at the same time other very valuable places were in working operation in the Coulsills and little limestone. And with reference to the allusion made by "N. C." in the Journal of the 11th, that is scarcely worthy consideration, as being merely reiteration.—*Blanchland, Northumberland.* J. BARRON.

FOREIGN MINING AND METALLURGY.

The movement of affairs in Belgium has been very quiet; but, nevertheless, some orders for iron of every description have been received at the works, which are, upon the whole, in a relatively favourable state. The Belgian pig-iron market cannot be spoken of so favourably, as, notwithstanding the sacrifices which forgemasters consent to make, the offers put forward are much superior to the demand. Casting pig, No. 1, is quoted at 3*l.* 12s. per ton; ditto, No. 2, 3*l.* 10s.; ditto, No. 3, 3*l.* 8s.; ditto, No. 4, 3*l.* 6s.; ditto, No. 5, 3*l.* 4s.; ditto, No. 6, 3*l.* 2s. per ton. From these prices concessions, varying from 1s. 8d. to 2s. 6d. per ton, would be made in the case of important contracts. The last contract for rails concluded by the Syndicate of Belgian Works is for 8000 tons, and the price obtained is tolerably remunerative. The contract has been let by M. Bouquié, contractor for public works at St. Petersburg, who last year gave out some important orders to Belgian metallurgical industry, in connection with the renewal of way on the St. Petersburg and Moscow Railway, and also with the gas-lighting of Moscow, of which he is concessionnaire. Other contracts are stated to be in course of negociation with the same contractor. The Belgian coal trade is now in its dead season, and were it not for some deliveries by railway it might be said that business almost completely made default. The extraction has been everywhere reduced as much as possible, and where the workpeople are not occupied with repairing operations they are only partially employed; happily, agriculture offers a compensation to many of them, as agricultural industry stands in need at present of an additional supply of labour. Navigation has been temporarily interrupted in the Blef d'Haumont (Nord); this interruption, which has been occasioned by the construction of a bridge at Haumont, is expected to terminate today (Saturday). Meetings are announced as follows:—Gasson-Lagasse Coal Mining Company, July 27, at Liége; Montigny-sur-Sambre Blast Furnaces and Rolling Mills Company, July 31, at Brussels; Longterne-Ferrand Colliery Company, Aug. 3, at Elouges; United Viviers Collieries Company, Aug. 4, at Gilly; Falnuée Collieries Company, Aug. 11, at Courcelles; Marcinelle and Couillet Company, Aug. 13, at Brussels.

As regards France, it may be observed that the group of the Nord alone persists in its efforts to establish an advance, and those efforts appear to be altogether vain. Some contracts for pig have been concluded in the Moselle at 2*l.* 8s. to 2*l.* 9s. 8d. per ton in warehouse at the works; as several forgemasters of the Nord have kept a number of their blast-furnaces out of blast, the proprietors of rolling mills are under the necessity of addressing themselves to the Moselle group, in order to obtain the pig which they require, and which they succeed in securing, it will be seen, at very advantageous rates. The forgemasters of the Moselle have, we may add, addressed to the Minister of Commerce and Public Works a complaint with reference to the tariffs charged for the conveyance of coal and coke from Forbach. The petitioning forgemasters state that since the opening of railway communication in the district no reduction of rates has been made in their favour; on the contrary additional terminal charges have been imposed since October, 1858. Yet the railway company concerned has reduced its rates in the case of other groups, and especially as regards the Haute-Marne. What the petitioners now solicit the Minister of Public Works to do is to compel the railway company to establish the tariff from Forbach to Ars at the same rate as that from Forbach to Sarreguemines. In the Haute-Marne coke-made iron is quoted at 7*l.* 4s. to 7*l.* 8s. per ton, and charcoal-made iron at 8*l.* 12s. to 8*l.* 16s. per ton; the current of orders, especially for Paris, continues good. The Val d'Osne Blast-Furnaces and Foundries Company will hold its annual meeting, July 30, at Paris. It appears from the report just presented to the shareholders in the Marseilles Gas and Blast Furnaces Company that the profits of the last year amounted to 42,667*l.* After statutory reductions had been made for the reserve, and for the redemption of the shares, there still remained a profit of 37,440*l.* available for dividend, admitting of a distribution at the rate of 1*l.* 0s. 10d. per 20*l.* share.

In 1865, a company was formed for the working on an extensive scale of sulphurs in Sicily, but as the capital of this company was never taken up, it was never legally constituted, and in consequence it was never brought into operation. A new company has just been constituted under the *regime* of the law of 1867, and under the title of the Grotta Calda Sulphur Mines; the capital proposed is 160,000*l.*, divided into 8000 shares. The company has entered into arrangements with the French *Societé Générale* for the sale of all the sulphur which it produces, with a stipulated minimum of 15,000 tons per annum during a period of ten years. The new company has also made arrangements with the Prince de San Elia for a concession of the mines, which it will work in consideration of a sum of 140,000*l.*; as a guarantee for the production of 30,000 tons of sulphur at the least in 30 years, the Prince has given to the company a mortgage inscription on all his landed properties, which are very large. It is announced that a professor of mineralogy has discovered a means of giving to the fossil coal which abounds in the valley of the Alps all the qualities of the best English coal. The process employed consists of a cheap chemical preparation, by which the coal of the Alps is mixed with the naphtha and bitumen obtained in large quantities from the Apennines. If experiments which are now being made terminate in a satisfactory result we must augur favourably from this discovery, the financial and economic consequences of which will be very great for Italy, which has now to supply herself with coal abroad. It may be remarked that the new process is stated to be already employed in France, and that the Carvin Company has made arrangements for the working in the Nord and the Pas-de-Calais of a patent taken out last year. It remains to be seen whether the qualities of the French coal are identical with those of the Alpine coal.

A retrograde movement has appeared in Chilian copper at Paris and Havre; at the same time, a large amount of business has been transacted at the latter centre. At the last dates the Havre market had assumed a more quiet aspect, Chilian in bars closing at 72*l.* per ton for disposable, Paris conditions; and 73*l.* to 73*l.* 6s. per ton, with delivery in August and September. A slight improvement is indicated in tin in the reports from Amsterdam and Rotterdam; some demand has prevailed for Banca, various lots of which have been dealt in at 54¼ fls., 54½ fls., and 54¾ fls.; the closing quotation being 55 fls. As regards Billiton, 400 ingots of disposable and 700 ingots under sail have changed hands at 53½ fls. But little activity has prevailed in tin on the French markets. Feebleness is remarked at Marseilles, where Banca and English tin in sheets are quoted respectively at 96*l.* and 98*l.* per ton, while at Paris the demand for Banca is very restricted at 97*l.*, and for Detroit and English at 96*l.* per ton. There is no change to notice in lead; at the same time, the demand remains in a languishing state. The zinc markets preserve almost the same aspect as in preceding weeks. At Breslau prices have been stationary, with very little doing. At Hamburg, also, affairs have not regained any activity. On the Paris market transactions have almost completely made default; rough Silesian has been quoted at 20*l.* 12s., and zinc from other sources 20*l.* 4s. per ton.

ACADIAN GEOLOGY.

The name of JOHN WILLIAM DAWSON is so universally known in connection with Acadian Geology, that whenever sterling information is sought upon the subject Prof. DAWSON'S works are almost instinctively turned to, and it is seldom indeed that the search is made in vain; he has laboured long and diligently in the same field, and has ever taken care to give prominence to the innumerable facts he has from time to time collected, rather than to the doubtful, though interesting, theories which might have been founded upon them. In the course of the twelve years which have elapsed between the issue of the first and second editions of his principal work, Prof. Dawson has had, and has freely availed himself of, the opportunity of continuing the study of every detail relating to the geological formation of the provinces to which his work refers, and, as a not unnatural result, the new edition* just issued is replete with interest and instruction. But the great value of the work arises from the care that has been taken to give the book a practical commercial value, by treating of the structure and fossils of the region in such a manner that not only the nature but also the present and prospective value of deposits of useful minerals, whilst the circumstance that Prof. Dawson has now pecuniary interest in the mines of the Acadian provinces, and has received no public aid in furtherance of his explorations, every reliance may be placed upon his impartiality.

After pointing out the general physical features of Acadia, Prof. Dawson proceeds to enquire into the structure of its different rock formations, the various materials of which they are composed, the manner in which they were formed, the periods of the earth's history in which they were produced, and the evidence they afford of the condition of the earth in those periods, the fossils which are embedded in them, and the useful minerals they contain. The chapter devoted to the modern period is particularly interesting, since it shows that within the comparatively small district alluded to in the work many of the most important operations necessary to account for geological appearances may be observed actually going on. The impression of modern rain drops in clay at the Bay of Fundy, which are illustrated, and a comparison of them with those found in the carboniferous formation at Tatmagouche, and with the impression of continued rain in the same formation, may well form a subject for study. The bogs and peaty swamps are another class of modern deposits very fully noticed. Regarded from a strictly geological point of view, the chapter on the post-pliocene period will prove as attractive as any in the book. Prof. Dawson arranges the deposits of this period into four groups—the gravel and sand beds, and ancient gravel ridges and beaches, indicating the action of shallow water and strong currents and waves; stratified clay with shells, showing quiet deposition in the deeper water; unstratified boulder clay, indicating the united action of ice and water; and peaty deposits, belonging to a land surface preceding the deposit of the boulder clay. Of these the unstratified boulder clay is most generally diffused in Acadia, and to this especial attention is given. His descriptions of travelled boulders and of peat under boulder clay, his explanation of the origin of drift and of stratified gravels, and his record of the evidence of the mastodon having lived in Nova Scotia are at once important and highly interesting.

And the interest that must be felt in the study of the mineral resources of Acadia, as described in Prof. Dawson's book, is not likely to be lessened by the circumstance that it was the rocks of Acadia that contributed, among other important additions to geological science, the first known indications of carboniferous reptiles, the only known carboniferous enaliosaurian, the only carboniferous land shells known, the first carboniferous myriapod, the first Devonian insects, the only well characterised primordial fauna in America, and the richest known Devonian flora. As might be anticipated from such a list as this, Prof. Dawson's account of the carboniferous and Devonian periods are full of interest. He states that the total vertical thickness of the immense mass of sediment constituting the carboniferous system in Nova Scotia may be estimated from the fact that Sir W. E. Logan has ascertained, by actual measurement at the Joggins, a thickness of 14,570 ft., and this does not include the lowest members of the series, which, it developed and exposed in that locality, would raise the aggregate to at least 16,000 ft. It is certain, however, that the thickness is very variable, and that in some districts particular members of the series are wanting, or are only slenderly developed. Still the section at the Joggins is by no means an exceptional one, since Prof. Dawson has been obliged to assign to the carboniferous deposits of Pictou, on the evidence of the sections exposed in that district, a thickness of about 16,000 ft., and Mr. R. Brown, of Sydney, has estimated the coal formation of Cape Breton, exclusive of the lower carboniferous, at 10,000 ft. in thickness. Prof. Dawson's restorations of the fauna and flora of the Devonian and carboniferous periods give every evidence of care, judgment, and ingenuity; and, although in some instances the restored forms do not strictly accord with the ideas of certain European geologists, it must be remembered that he has had far better opportunities than they for observation, and that he is not one whit less likely than they to

* "Acadian Geology: the Geological Structure, Organic Remains, and Mineral Resources of Nova Scotia, New Brunswick, and Prince Edward Island." By JOHN WILLIAM DAWSON, M.A., LL.D., F.R.S., &c. Second Edition, revised and enlarged. London: Macmillan and Co.

draw accurate conclusions from the observations made. Thus his restoration of megaphyton magnificum is, to say the least, as plausible as that of Brogniart, who supposes the leaf scars to have been produced by branches, pednucles, or adventitious roots. It is, of course, annoying to European geologists to have all their pet theories overthrown by the facts of a single observer; but if that observer have had great facilities for observation, and have more successfully applied his knowledge to the discovery of the truth, it would be well for others rather to abandon their erroneous notions manfully than to add to confusion of their ideas by attempting to distort observed facts, in order that they may agree with their fallacious theories.

The second edition of "Acadian Geology" is likely long to enjoy a high reputation, both in the Old World and the New; and as Prof. Dawson has long devoted special attention to the investigation of the palæontological remains of the geological formations which occupy the more important place in the provinces with which he is connected, it is certainly preferable to adopt his view than those of geologists whose acquaintance with the facts must of necessity be less, although they may enunciate their theories with far greater assurance. The work is illustrated with beautifully executed engravings of the various localities, sections, fossils, &c., of more than ordinary geological interest. The style adopted by Prof. Dawson is one which, whilst concise enough for the sternest utilitarian, is so interesting that it cannot fail to be attractive to the general reader, so that the book will doubtless find a place in the library, not only of the scientific geologist, but also of all who are desirous of the industrial progress and commercial prosperity of the Acadian provinces.

PRACTICAL MINING—CONCENTRATION.

The preparation of ores for market is a subject of such paramount importance in connection with the profitable working of mines, that it is remarkable that the works referring to it have hitherto been so very few and incomplete; indeed, with the exception of mere passing references made by way of introduction to other subjects, scarcely any information upon the treatment of ores has been obtainable by the practical miner, unless he were able to consult the comprehensive works of the mining engineers of Germany. To supply the deficiency an elaborate and very valuable volume* has just been completed by M. GUIDO KUSTEL, whose admirable work on the Nevada and California processes of silver and gold extraction was some time since noticed in the *Mining Journal*. Mr. Kustel's object has been to show the present condition of the art of concentration, putting forth the principles on which it is founded, without entering into scientific considerations, and has thus succeeded in producing a work of real practical utility. By way of introduction, Mr. Kustel describes the various modes of dressing, separating, cleansing, and sizing ores; and he then proceeds to the consideration of crushing, breaking, and stamping machinery, jigging and buddling apparatus, special concentration of gold, silver, and other ores, and chlorination.

The object of the dressing of ores is the separation of the worthless from the valuable portions, as closely as possible, with the least loss, and the smallest expense. A very close separation is difficult, and not always advisable. The less value a mineral contains so much the closer may its separation from gangue be effected. The principles upon which the dressing of ores is based are—each constituent of the mass must be brought to the highest value which can advantageously be given to it; the useful minerals must be concentrated only to the most advantageous degree of purity; and all loss of the quantity and value of the useful mineral must be avoided as far as possible. Having stated these principles, Mr. Kustel points out the manner in which they are applied in practice. Ragging, spalling, hand-picking, as well as the use of sluices, kilns, riddles, rockers, trommels, and sifting-wheels are in turn treated of, so that the reader is thoroughly prepared for the section on reduction.

The concentration of ore particles in a mass, and the rejection of the worthless rock, by means of water on proper machines, requires a definite size of ore particles, to which it must be broken, crushed, stamped, or ground, according to the nature of the ore, which must also determine the mode of concentration, and, consequently, the size of grains. Experience has shown that crushing under rollers and breakers produces a great deal less dust than under stamps, and this again a good deal less than the reduction by grinders. Referring to stone-breakers, Mr. Kustel observes that a serious objection to substituting breakers for stamps is found in the difficulty in pulverising ore which is wet or damp, or intermixed with clay or mud. There are, he says, in reality few mines where a proper material could be extracted for the breakers, unless picked or dried. The earliest breaker in which the movable jaw seems to have been used is that of Hanscom, which he describes as consisting of a movable jaw, on which is placed a die or face, made of white iron, so fitted as to be easily replaced when worn. The frame is made of cast-iron, of sufficient strength to withstand the strain caused by the pressure between the two dies. The other die, corresponding with first, is fitted in the frame immovable, except when required to be replaced. Mr. Kustel also describes Blake's well-known and extensively-used crusher, which has frequently been referred to and regularly advertised in the *Mining Journal*. There is an admirable chapter on stamps, and in this connection the record of the experiments made by Mr. J. E. Clayton are particularly interesting. He found that with a steam battery, 600-lbs. stamps, and 9-in. lift, the most productive speed is 100 lifts per minute. In wet crushing 100 strokes per minute produced twice as much as with 60; with 130 strokes he got very little more than with 100; with 170 strokes he got only as much as with 60; and with 200 strokes hardly anything. Mr. Kustel repeats the assertion that it is undesirable the stamps should fall in the order 1, 2, 3, 4, and maintains that the order 4, 1, 2, 3 is preferable, although it is difficult to understand the difference of the order after the first few strokes. After referring to the discharge in dry and in wet crushing, he describes the feeding of batteries with ore; explains the quantity of water required for crushing, reduction by rolling-mills, feeding of rollers, grinding, and the various arrangements used for it, and comments upon each.

The section devoted to the treatment of concentration is equally systematic and useful. Concentration by means of water, depending principally on the difference of specific gravity, he divides the subject into two parts—concentration by relative resistance to a free fall in standing or moving water, and concentration by resistance on an inclined plane. There is great difference in the arrangements and methods of these two divisions, both of which, however, are often found operating in one and the same establishment. Jigging separates the coarse ore particles from similarly coarse gangue, which latter, still involving ore in a finer condition, must either be further reduced for a second jigging, or directly transferred to fine crushing after the first jigging, and concentrated on percussion or other tables. In connection with jigging, Mr. Kustel mentions that the falling speed of grains is very important. Rittinger found that *a*, a round globule of galena, one-eighth of an inch in diameter, and a quartz globe, four-eighths of an inch diameter, will both reach the bottom of a column of water at the same time. The volume of the quartz globule is 64 times that of the galena, and the absolute weight 22 times as great as that of the galena globule, which arrives at the bottom at the same time; and *b*, crushed ore particles, differ in shape, representing three main classes, comprising about 50 per cent. of roundish grains, 25 per cent. oblong, and 25 per cent. of flat-shaped grains. The falling speed in water of the round grains is = 112; of the oblong, = 97; and of the flat-shaped particles, = 79. The proportion of these three classes varies according to the internal structure of the mineral—galena breaking into cubes will produce nearly 60 per cent., quartz breaking irregularly only 40 per cent. of roundish grains. Calc-spar agrees pretty nearly with the above proportions. The various information relating to the separation of ore grains having been given in an equally complete and practical way, the concentration of ore sands and slimes are considered, and drawings are given of many of the ingenious arrangements of Rittinger, which have frequently been referred to in the *Mining Journal*.

Special concentration, embracing the concentration of gold and silver ores, and of lead, copper, and other ores, occupies the fourth section of the work. The separation of gold from crushed ore is performed by quicksilver, by water on an inclined plane, or by amalgamation and concentration combined. The quantity of quicksilver necessary for separation varies largely, according to the mode adopted. The arastra and battery amalgamation give a better result. If only as much quicksilver is used as is required to form a hard amalgam. The pan amalgamation, on the contrary, needs from 60 to 100 lbs. of quicksilver as a constant charge in the pan. Quicksilver always dissolves gold, but, fortunately, only to a certain amount—$3\frac{1}{4}$ oz. to $11\frac{1}{4}$ oz. to 100 lbs. of mercury. Mr. Kustel states that the combined method of concentration and amalgamation gives the best result, provided no grinding amalgamation be attempted—firstly, if the concentrated stuff be designed for smelting, on account of lead and silver or copper, in which case the gold, by a preceding amalgamation, is saved from the unavoidable smelting loss of 3 to 4 per cent., and the loss of concentration; and, secondly, if the concentrated sulphurets be intended for extraction of gold by chlorination, whereby coarse gold particles are not converted into chloride of gold. The concentration of silver ores is generally a most delicate operation, being subject to heavy loss, which cannot be avoided. It is an important rule to separate by hand as much of the richer part as possible, leaving the poorest for concentration, and to reject, at the same time, the worthless rock. The concentration of lead, copper, and other ores does not differ from that of silver ores, unless the ore be disseminated in coarse particles. To find out whether a given kind of ore is worth concentrating, an experiment is the best and most reliable guide; the reliability, however, depends upon the extraction of a sufficient quantity of ore, and on the taking of a true average. The degree of concentration, and the concentration itself, depends greatly on local circumstances. There is a limit beyond which no concentration can take place profitably—for instance, some kinds of ore may be sold for the same amount as the concentrator would derive from a higher bid for the concentrated stuff therefrom, after deducting the concentrating expenses; whilst in other remote places, destitute of fuel, it may be necessary to concentrate as high as possible, to reduce the bulk, on account of transportation.

The concluding section of the work is devoted to the description of the extraction of gold from sulphurets, arseniurets, or quartz, by chlorination. The process is based upon the property of chlorine gas to transform metallic gold into soluble chloride of gold, in which condition it can be dissolved in cold water, and precipitated, in the metallic state, by sulphate of iron, or as sulphide of gold, by sulphuretted hydrogen gas. The extraction by this process, if well executed, is very perfect. The roasting of the sulphurets or arseniurets is very simple; the principal aim must be directed to a perfect dead roasting—that is, the expulsion of all sulphur. Zinc, antimony, and lead are not obstructive to the extraction of gold by chlorination; but it is not as yet determined by experience whether or not a great amount of galena would, to a certain extent, prevent chlorination. From the very complete manner in which every portion of the subject is treated, and from the care taken to explain the principles upon which the success of each particular process depends, and thus enable his readers to introduce the necessary modifications to adapt it to the ore under treatment, Mr. Kustel's work will be as useful to the miners of this country as to those of America. It is certainly the most perfect work upon the subject of which our language can boast.

* "A Treatise on Concentration of all Kinds of Ores: including the Chlorination Process for Gold-bearing Sulphurets, Arseniurets, and Gold and Silver Ores generally." By GUIDO KUSTEL, Mining Engineer and Metallurgist. San Francisco: Office of the Mining and Scientific Press.

THE MINERAL RESOURCES OF ITALY.

The flourishing condition of the mining and metallurgic arts in ancient Italy is proved by abundant evidence. They continued to prosper during the middle ages, but in later times they fell into decay, and the metallic production of Italy has not kept pace with that of other countries. This inferiority is chiefly attributable to the want of coal, which more than any other cause has contributed to check improvement, and discourage enterprise. The existence of a great number of mines in different parts of the country is well known, but there is no complete mineralogical description of the whole peninsula. The right of property in mines is not determined by the same laws throughout the country. In Northern Italy generally the discoverer of the mine has a prior claim to that of the owner of the soil above it; whereas, on the contrary, in Tuscany and the Neapolitan and Sicilian provinces the right of property in the land gives an absolute title to the possession of the mine which it covers. Special mining education is giving at Florence, Caltanissetta (in Sicily), Carrara, and Bergamo.

Italy imported in 1865 from Great Britain 32,019 tons of bar-iron, of the value of 520,000*l.*; from France, 3500 tons; and from Austria, 2800 tons. Of steel there was imported from England 665 tons; from Austria, 414 tons; and from France, 330 tons. Traces are in several places found of copper mines worked by the Etruscans, among whom this metal was in common use, and who exported it in considerable quantities, particularly to Greece. The copper mines of the Alps, and those of the valley of Aosta in particular, were also celebrated in ancient times. In the middle ages the copper of Massa was an important article of commerce. There seems to have been a regular exportation of it in the fourteenth century to Antwerp and Bruges. The number of mines now worked in Italy is 22—of which there are in the district of Turin 6, in that of Genoa 7, of Milan 3, of Venice 2, and of Florence 4. The total quantity of ore extracted annually amounts to about 32,010 tons, representing the value of 62,068*l.* The mines employ 2232 persons. The quantity of fine metal produced amounts to 1012 tons, the value of which was 111,748 tons. The average annual exportation of ore is 1330 tons, of the value of 9040*l.*, and that of wrought copper comes to 523 tons, of the value of 61,640*l.* Argentiferous galena is found in Tuscany, Calabria, Sicily, and chiefly in the Island of Sardinia, where it exists in great abundance. About 304 quintals of lead ore, worth 240*l.*, were imported, while 178,737 quintals, worth 157,400*l.*, were exported. The importation of lead amounted to 3870 tons, against an exportation of 1511 tons. Gold is obtained in small quantities from the pyrites of the Alps, the quartz of the Apennines, and the sands brought down by rivers, as the Orco, the Ticino, the Po, and others. Its total annual value is about 20,000*l.* Italian goldsmiths' work still continues to deserve a high reputation. It has some peculiar characteristics, and is remarkable for artistic excellence in design and precision in execution.

There are four mercury mines in Tuscany, but only one of them—that of Siele, near Castelazana—is now worked: 3000 quintals of ore were extracted in 1864, yielding from 2 to $2\frac{1}{2}$ per cent., or in all $6\frac{1}{2}$ tons, of mercury. From the mine of Agondo, in Venetia, 44,600 quintals of ore, yielding 23 tons of mercury, were obtained. There is only one zinc mine, that of Argentiera. About 2800 quintals of ore, which yields 40 per cent. of metal, are annually extracted. The average value of the exportation of zinc does not exceed 1400*l.*, against an importation to the amount of 49,800*l.* Sulphuret of antimony is found at Montanto, in Tuscany; it yields from 35 to 80 per cent. of regulus, which is highly valued for its purity. About 50 tons of the metal are produced, the greater part of which is exported to France, England, and America. Nickel and iron pyrites are obtained from mines in Piedmont. Manganese is found in the valley of Aosta, in Tuscany, in Sardinia, and in Sicily. The art of casting in bronze, which has enriched Italy with so many splendid monuments, shows no signs of decay; and great works continue to be admirably executed at Florence, Turin, Milan, and elsewhere. Remarkable progress has lately been made in bellfounding. Hammered copper is used to a considerable extent in some parts of Italy for decorative purposes. Articles for domestic use in tin, brass, and zinc are tolerably well made throughout the greater part of Italy.

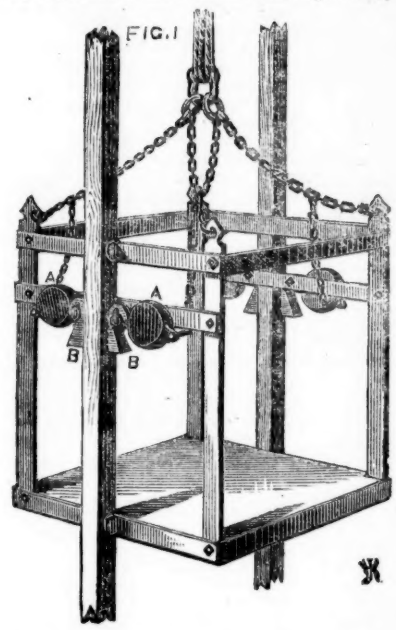
The mean annual quantity of sulphur obtained in the whole of Sicily is estimated at 1,600,000 quintals, whilst in 1830 it did not exceed 30,000 quintals. There are 615 mines, but 247 of them have not been worked since 1864. In the year 1866 there were exported to Great Britian 66,166 tons; to France, 38,437 tons; and to other places, 79,570 tons. There are 35 sulphur mines in the district of Ancona, but only 11 of them are now worked. Their total produce amounted in 1865 to 675,872 quintals. The number of persons employed is 1425. Sulphur is refined at various places in Sicily and the Romagna. The total quantity obtained by distillation was, in 1864, 82,250 quintals. This product is exported to Trieste and the Levant. There is a considerable demand for it at Rome, as well as in Tuscany and Lombardy, where its consumption in the treatment of the vine is large. Since the year 1862, however, the price has fallen from 20 fr. 70 c. to 13 fr. 50 c. Petroleum is found in the district of Chieti (Abruzzo, Citerione), and in the Emilia Provinces. Its production, however has hitherto been insignificant, not exceeding about 1896 quintals annually.

Anthracite is found in the valley of Aosta, but the great quantity of ashes which it leaves is an objection to its use, and the annual get does not exceed 40 tons. There is also a bed of anthracite at Seni, in the Island of Sardinia, but it is not worked. Lignite occurs in great variety and abundance in Tuscany, Venetia, and the Southern provinces of Italy: that which is found in Montebamboli, Tuscany, is considered by some to be true coal. The annual produce of the mine is 1615 tons. It is calculated that 1 ton of Newcastle coal is equal to about 1 ton 2 cwt. of Montebamboli coal, and to from $1\frac{1}{2}$ to 3 tons of lignite. Newcastle coal costs at Leghorn about 40 frs. a ton, whereas the price of that of Montebamboli is only 22 frs. Peat is used as fuel in many parts of Northern Italy. It is advantageously employed in various industrial establishments, and particularly in ironworks. The amount of the production of the different kinds of fuel above mentioned was, in 1684—of anthracite 40 tons, of lignite (including the Montebamboli) 44,515 tons, and peat 76,931 tons.

All the salt works, with the exception of those in Sicily, are the property of the State; some of them are managed directly by the Government, while others are in the hands of contractors. The salt is obtained from the salt marshes, at Cagliari and Carloforte, in Sardinia; Trapani, Marsala, and Agosta, in Sicily; Portoferrajo, in the Island of Elba; Miliscola, near Naples; and on the Adriatic coast at Barletta, Cervia, Comacchio, and Treporti, near Venice; and likewise from salt-mines existing in Tuscany, Sicily, and Calabria, but of which only one, at Lungro, near Cosenza, is regularly worked; as well as from salt springs found at Salso-Maggiore, near Pauna, and at Volterra, in Tuscany. The yearly produce is—sea salt, 370,148 tons; spring salt, 11,084 tons; and rock salt, 7164 tons. Salt is more heavily taxed in Italy than in almost any other country, and its production and consumption are very inferior to those of France and England. With regard to the chemical products connected with the minerals, sulphuric acid is made at Turin, Milan, Venice, Rimini, Bologna, Naples, and Palermo. The total quantity produced is about 75,000 metrical quintals yearly. The other chemical products which have any commercial importance are—Nitric, muriatic, citric, and boracic acids, of which the average annual exportation amounts to 1250 tons, value 255,080*l.* Potash and soda, exportation 7392 metrical quintals. Whitelead, made at Genoa and Leghorn; and oxide of lead, made at Venice: value of exports, 17,360*l.* Alum, obtained in Tuscany. Cream of tartar, average exportation 14,299 metrical quintals, value 51,440*l.* Corrosive sublimate and red precipitate, prepared at Milan and Venice, for exportation chiefly to Turkey and Russia. Litharge, &c. Gunpowder, manufactured in Government mills in 1865, 1,176,018 kilogrammes, besides the produce, not ascertained, of 67 small private mills in Tuscany, Romagna, Umbria, and the Marches. And, in conclusion, the revival of the art of working in terra cotta ought to be mentioned. In Lombardy, Venetia, Tuscany, and Piedmont some considerable establishments now exist where this material is successfully employed for architectural decorations, vases, chimney pieces, stones, flooring, draining pipes, &c.

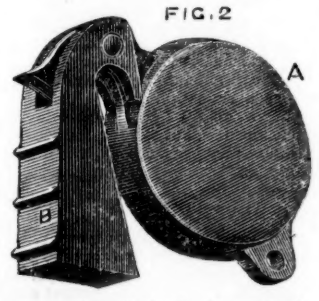
BELLHOUSE'S SAFETY-CAGE.

The loss of human life which is constantly taking place from accidents with colliery cages and hoists renders it imperative that we should take every opportunity of placing before the public the means whereby these catastrophes may be prevented. In this interest, therefore, we now give a description of a very efficient apparatus, the working of which we lately examined and found to be exceedingly perfect and trustworthy in its action. It is the invention of Mr. Bellhouse, and consists in the application of the wedge principle—the safest and simplest he could have chosen. In our illustrations, Fig. 1 is a perspective view of a colliery chair or cage. The four weighted levers, A, are hung on to wrought-iron studs and fixed by means of a movable joint to serrated wedges, B, or inclined planes. The other ends of these levers are connected to the suspending rope or chain, which carries the cage, either, as in our engraving, by chains passing inside the cage, or, very frequently, by rods passing outside, in order to leave more room and to allow of an iron-plate cover to the cage to protect the men inside from injury in case of the rope or anything else falling down the shaft. When the suspension chain or ropes break, the weighted levers fall, and the other extremities of them passing through a slot in the wedges are forced against the conductors and immediately prevent the wedges from moving further down the shaft. They are, in fact, fast to the conductors, whilst the cage acting upon the studs, which form part of it, slides the studs down on to the thicker part of the wedges, and thus the heavier the cage the further the studs slip and the tighter are the wedges pressed against the conductors. Fig. 2 is an enlarged view of the wedge and weight. It will be seen from this explanation that this apparatus differs in some respects from every attempt hitherto made to stop falling cages, for it does not depend upon springs or weights for the power required to arrest the falling chair, but upon the cage and load themselves. Its action is, therefore, twofold—firstly, the rope being broken, a spear-shaped end of the lever strikes into the conductor, and the power required to do this is very slight (a spring prevents its slipping out again), and thus the wedge is prevented from sliding; and, secondly, the cage acts as a weight in wedging itself fast. Nothing could be more simple, and, as the weights, wedges, and studs are made of different metals, there is but little chance of them becoming fast at the joint from rust or disuse. There are so few working parts or surfaces that there is no liability of the apparatus getting out of order, and the wedges give such an extent of bearing surface against the



conductors that no material injury is done to the wood. In case of ice on the guides, its action is found to be sufficiently powerful to pierce and crumble the frozen particles, and to arrest the cage as easily as if no ice had been present. When once fixed there is never any chance of the apparatus stopping the cage, unless the rope or chain breaks, and when it does stop it, from its very principle, it does so gradually, and without any apparent jerk.

We are glad to be able to state that this safety apparatus has been extensively adopted in mills, warehouses, and hotels, and gives every satisfaction, and we hope soon to see it used in mines, where it would prove invaluable. The wedges of the hoists in mills, &c., are usually set against the opposite corners, and press outwards instead of inwards, the majority of hoists in buildings working in corner guides in a well or shaft sufficiently strong to bear the pressure. In some cases it is, however, necessary to fix side conductors, as in our illustration, where the walls of the shaft or well are inadequate for the support of the requisite strain. In hoists provision is also made for stopping the cage at will in cases where straps slip, overloaded cages, or when the brake does not act—so that its action is under the control of the man in the hoist, and yet perfectly self-acting in case of the breaking of the rope. We may add that Mr. J. W. Harland, of 56, Percival-street, Chorlton-on-Medlock, Manchester, is Mr. Bellhouse's sole agent in the matter of these hoists, which we strongly recommend to public notice.—*Mechanics' Magazine.*



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